TD

Distr.
GENERAL

TD/B/C.4/AC.11/6
8 November 1991

United Nations Conference on Trade and Development

Original: ENGLISH

TRADE AND DEVELOPMENT BOARD
Committee on Shipping
Group of Experts on Multimodal Transport
Geneva, 9 March 1992
Item 2 of the provisional agenda

DEVELOPMENTS IN THE FIELD OF CONTAINER STANDARDS

Report by the UNCTAD secretariat

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GE.91-52142

Abbreviations

APC	American President Company
BR	British Railways
CEN	European Committee for Standardization
COFC	Container on flat car
ESCAP	Economic and Social Commission for Asia and Pacific
ECE	Economic Commission for Europe
ECMT	European Conference of Ministers of Transport
GBP	Great Britan pound
IICL	Institute of International Container Lessors
ICHCA	International Cargo Handling Co-ordination Association
IMCO	Intergovernmental Maritime Consultative Organization
ISO	International Organization for Standardization
TC 104	Technical Committee 104 - "Freight Containers"
TOFC	Trailer on Flat Car
TEU	Twenty-foot equivalent unit (container)
USD	United States dollar
WG 4	Working Group 4 - "Future Containers"

INTRODUCTION

(i) The Committee on Shipping at its fourteenth session adopted resolution 67 (XIV) "Multimodal transport including work programme".[1] In the programme of work in the short term the UNCTAD secretariat was called upon "to monitor trends in multimodal transport and containerization and the technological developments in these fields, and to keep Governments abreast of such developments". The Committee also recognized the need to avoid widening the gap between the developed and developing countries *inter alia* with "the use of larger than current ISO standard containers". It instructed the UNCTAD secretariat "to take part in the meetings of the International Organization for Standardization's Technical Committee 104 (TC 104), in order to monitor the developments concerning the "new generation" containers, and to ensure that developing countries' views are adequately taken into account."[2]

(ii) At the same session, the Committee on Shipping further requested the secretariat to study the trends in the change of dimensions of containers in use and the impact of the introduction of such new container dimensions on the economies of the developing countries, taking into account the interests of all concerned parties. The study should include an economic, social and environmental analysis and evaluation of possible costs and benefits which might result from the introduction of such containers. Pending the completion of the study, the Committee expressed reservations about the introduction of non-ISO standard containers.[3]

(iii) The present report has been prepared by the secretariat in response to these requests. The report is based on information which has been collected by the secretariat through desk studies supported by input from different organizations, especially from the Economic and Social Commission for Asia and Pacific (ESCAP), which has recently published a study on the policy options for the inland transportation of non-ISO containers.[4]

(iv) The Committee on Shipping requested the Group of Experts on Multimodal transport to discuss developments in multimodal transport and containerization wherever there is a sea link, to take stock of the main problems experienced by users and providers of multimodal and/or container transport operations and to suggest elements of a future programme of work for the Committee in the field of multimodal transport and containerization. Taking into account the importance of container dimensions in multimodal transport development, the present report will be before the Group of Experts for consideration.

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1 Report of the Committee on Shipping on its fourteenth session (TD/B/C.4/336).

2 Resolution 67 (XIV).

3 *Idem.*

4 "Policy options for the distribution of maximum dimensions ISO containers", ESCAP report. Bangkok, July 1991.

SUMMARY AND CONCLUSIONS

1. The present international container standards concerning dimensions and ratings, elaborated by the International Organization for Standardization (ISO), reflect a fair balance between the different technical, safety, operational and economic requirements of marine, rail and road transport. Wide voluntary acceptance of these standards has been confirmed by the increasing homogenity of the world container stock, which is the basic element of modern multimodal transport service.

2. The spirit of the ISO policy on container standards - constancy - and the worldwide application of these standards should be maintained, so that the operators and manufacturers throughout the world have confidence in standards. For the long-term development of the industry it is essential that the standards remain stable.

3. The use of containers larger than the ISO standard may be economically justified and advantageous in some trades. However, proliferation of the number of standard sizes may be more damaging in terms of the efficiency of transport operations than the use of a standard which may not completely satisfy all users. Experience has shown that the introduction of larger containers, as a rule, requires massive additional investments in rolling stock and infrastructure. This has an impact on the cost of operation and, in the end, usually leads to higher freight rates. Thus, the final effect of the introduction of larger containers may be quite the opposite to the objective desired.

4. The adoption of 9-foot 6-inch high containers as an international standard was not justifiable. Though containers of this height have been gaining in popularity, with a share in the total world container stock of over six per cent, this fact in itself cannot justify the designation of this dimension as an international standard. Carriage of such containers in containerships generally leads to some loss of total carrying capacity; inland transportation of such containers raises many problems and is often impossible. In the inventories of carriers and lessors containers of this height continue to be considered as special. Because of infrastructure constraints there is at present no prospect for 9-foot 6-inch high containers finding universal acceptance.

5. Containers longer than ISO standards are, in general, in use in specific trades with high-volume, low-density cargo. There is as yet no universal need for these containers and there would seem to be little prospect of their being generally adopted in the near future. Furthermore, there are some indications that the markets where such containers are in demand, have approached saturation. Orders for such containers have been declining. There is thus no rational basis for recognizing them as a universal international standard.

6. An example will illustrate the potential economic effect of introducing containers that are longer than the ISO standards. The present maximum length of ISO containers is 40 feet. Container cranes have been built to accommodate such containers between their legs. If a port must convert its cranes to accept 45-foot, 48-foot or 53-foot containers, cranes have to be rebuilt (at best) or replaced (at worst). The cost of a new quay gantry crane is approximately USD 5-6 million. In order to be equipped with just four cranes a port would thus have to spend USD 20-24 million in scarce foreign exchange without any real hope of being able to recover the cost of the obsolete cranes built to handle 40-foot containers.

7. At the sixteenth session of the ISO Technical Committee 104 (May 1991) the Technical report "Future wide-body containers", with new empirical container dimensions that are incompatible with the existing container systems and which go beyond most existing infrastructure limits, was rejected; this is indication that these dimensions for the new-generation containers were not acceptable to the transport industry. The proposed dimensions are not reconciable with regional and worldwide requirements for container dimensions

based either on more generous road-traffic regulations or on the advantages provided by the efficient accommodation of locally used pallets. Unlike the existing ISO container standards, there are no prospects for the universal acceptance of the proposed increase in standard sizes.

8. These considerations imply that, at the moment, it would not be possible to reconcile regional standards based on specific requirements with the present worldwide ISO standards on containers. The international container system should continue to use the present ISO container dimensions. At the same time, nothing prevents regional and specific trade using other contaner dimensions for economic considerations. This is done, for example, in the case of intra-European combined transport, based on containers and swap-bodies permitting more efficient stowage of pallets of the dimensions prevailing in the region. It is also the case in the United States where domestic containers of bigger dimensions have become possible since the introduction of more permissive road regulations.

9. Many developing countries have only recently introduced containerization. They have invested heavily in both equipment and infrastructure to handle ISO containers. Holding stable the present basic dimensions of ISO standard containers will maintain confidence in the development of multimodal transport services based on these standards. For their domestic trades as well as for the trades between developing countries they do not need bigger containers. If, however, under pressure from operators seeking to introduce such containers, non-ISO containers enter developing countries, it would be logical if the cost of adaptation of their transport systems for handling such non-standard containers were borne by these operators.

10. The monitoring of developments in the field of standardization of containers has permitted the UNCTAD secretariat to draw the attention of ISO to the needs and requirements of developing countries in this area. At the same time, this activity has led the transport industry to recognize the need to have stable internationally-recognized and voluntary-accepted container standards. Based on information set out in reports prepared by the UNCTAD secretariat,[5] the Committee on Shipping in various resolutions[6] has drawn the attention of ISO to the negative technical and commerical consequences, for developing countries, in particular, of continuing increases in dimensions and maximum gross mass of containers.

11. Owing to the limited participation of developing countries in ISO meetings, the UNCTAD secretariat was expressly requested by the developing countries to liaise between them and ISO so as to represent their interests, especially in TC 104.

12. UNCTAD's activities in this field have thus contributed to the awareness among all interested parties that the problem of container standards has acquired growing political significance. The question that is now being debated is not what the future container dimensions should be, but whether there is any need for a new worldwide container standard at all. This has been confirmed by the growing homogenity of the world container fleet based on the present ISO container dimensions as well as by the fact that there is no noticable proliferation of bigger-than-ISO-standard containers in trans-continental trades.

13. The Group of Experts may wish to urge developing countries to participate more actively themselves in future ISO meetings so that their views concerning container dimensions and standards may be directly considered by TC 104. The UNCTAD secretariat stands ready to continue its support to developing countries in this area and transmit recommendations in this respect to the Committee on Shipping. The Group may thus wish to keep this activity in the UNCTAD programme of work in the field of multimodal transport and containerization.

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5 TD/B/C.4/270, TD/B/C.4/302, TD/B/C.4/314, TD/B/C.4/329.

6 Resolutions 55 (XI), 60 (XII), 61 (XIII), 67 (XIV).

I. Homogenity of the world container stock

14. Containers are the most important element in modern door-to-door transport service. Stability of the internationally agreed container standards is vital for safeguarding investments made in all links of the multimodal transport chain.

15. Statistics of the world container stock indicate that a high degree of homogenity of the world dry-cargo container fleet in relation to container dimensions and ratings have been maintained from the beginning of containerization on the basis of standards elaborated and adopted by ISO. This homogenity has been spreading constantly, reflecting the wide, voluntary acceptance by the transport industry of the existing ISO container standards. The most important of these standards from the point of view of intermodality is ISO standard 668, defining classification, external dimensions and ratings (maximum gross mass) of the series 1 freight containers. The essential parameters of the present ISO standard 668 have not been changed since their introduction in 1964. This fact has provided favourable conditions for development of containerization and the growth of multimodal transport operations throughout the world.

16. By mid-1990, more than 90 per cent of the world dry-freight container stock consisted of 20- and 40-foot long and 8-foot 6-inch high ISO standard containers (see table 1).

Table 1

Share of 20- and 40-foot long 8-foot 6-inch high containers
(In real units)

	1978	1980	1983	1986	1990*
Total number of containers	1,307,497	1,917,752	2,991,998	3,623,092	5,102,563
8'06" × 20' and 40' units	880,631	1,407,315	2,542,949	3,198,420	4,710,255
Per cent of total	67.3	73.4	84.6	88.2	92.3

Note: For 1990 the figures are in TEUs. Only dry-freight containers (excluding thermal, tank, flatrack and other types of special containers) were taken into account.

Source: Computed from the censuses carried out by *Containerization International* in 1978, 1980, 1983 and 1986, and by *Cargoware International* in 1990.

17. The sample study on the composition of the new container additions entering the industry, carried out by the UNCTAD secretariat[7], also confirmed that the vast majority of newly manufactured containers corresponds to the present ISO 668 standard as regards dimensions and ratings.

18. Stability of container standards has always been one of the main concerns of the UNCTAD Committee on Shipping in its work on multimodal transport and containerization. As long ago as the end of 1972, the United Nations/IMCO Conference on International Container Traffic, in its resolution No.4 on Container Standards for International Multimodal Transport, invited the Economic and Social Council to consider the practicability of eventually drawing up an international agreement on container standards. On the question of the eventual international agreement on container standards, further discussions revealed a profound difference in the positions of developed and developing countries in this regard.

19. Developing countries, supported by the group of eastern European countries, advocated the necessity of a flexible international agreement establishing an equitable and efficient regime for the evolution and application of internationally agreed container standards. These countries held the view that such a regime would better protect investments in the containerization of their trade made at great capital cost. Conversely, developed countries expressed the view that there was no need for such international agreement and that the existing institutional framework of ISO was

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7 TD/B/C.4/329.

quite satisfactory. Moreover, they stated that there was a danger of impeding technical progress by means of a binding document which might prove difficult to amend.

20. While agreement could not be achieved on this point, as a result of long discussions, resolution 22/1978 was adopted by the ISO Council, which requested the widest possible consultations over proposals for revisions of the ISO 668 standard which affected compatibility, intermodality and modularity of ISO containers. At the same time, the question of container standards was remitted to the UNCTAD Committee on Shipping for regular review.

II. Use of non-ISO standard containers

21. Previous UNCTAD secretariat reports[8] have described containers with characteristics not corresponding to ISO 668 standard as well as statistics concerning their use. First of all, these descriptions concerned high-cube 9-foot 6-inch (2.9-metre) high containers of standard length and width. Then came 45-foot long high-cube containers used in maritime transport, along with 48 and 53-foot long 8-foot 6-inch wide and 9-foot 6-inch high containers used almost exclusively in the United States domestic trade.

22. Though non-ISO standard containers have always been used by certain operators, such containers have appeared for reasons of economy of scale, since their use has become possible because of changes in local regulations concerning the dimensions of transport means, especially road vehicles. They have been principally introduced in specific trades for the carriage of high-volume, low-density cargo. The UNCTAD secretariat reports mentioned above (para 21) also referred to the difficulties raised by handling non-ISO containers in ports and terminals and their carriage by inland means of transport, especially in developing countries. For these reasons it was concluded that it would be premature to incorporate new (larger) container dimensions into the ISO standards.

23. Most non-ISO standard containers are high-cube 9-foot 6-inch high containers with standard length and width characteristics. Because these containers have the same base dimensions, they pose few problems during sea transportation by existing containervessels. However, in ports, and especially during inland transportation, their handling and movement are often limited or even impossible. Consequently, in inventories of lessors and carriers these containers are considered as specials.

24. Table 2 shows the relative growing popularity of high-cube containers. This growth was especially noticable in the period from 1986 to 1990. High-cube containers have been acquired both by carriers and lessors, although somewhat more reluctantly by the latter. In 1990, the share of high-cube containers in the lessors' fleets was half the share of such containers in the carriers' fleets. The overwhelming majority of high-cube containers in the middle of that year belonged to the North American owners, followed by Asian (Japanese and Taiwanese) and west European owners.

25. In contrast to this, there has been no significant proliferation of containers with length not corresponding to ISO 668 standard (in particular 45- and 48-foot long containers). Their total number in the world dry-freight container fleet, according to 1990 *Cargoware International* census, was 81,298 TEUs or 1.59 per cent. According to the previous census, made in 1986, their share was 0.84 per cent. The recent data[9] on delivery of newbuildings have revealed a slackening of demand for 45-foot long containers from the peak of 1987/1988. In 1988, some 11,500 45-foot containers were constructed; in 1990 this figure had declined to 5,000. It is estimated that fewer than 1,000 units were produced in the first half of 1991. In the production of one of the biggest plants in the Republic of Korea, (185,000 TEUs planned for 1991), only 1,000 or 0.5 per cent were expected to be non-ISO 24- and 45-foot containers.

26. The 45-foot containers were first introduced by the American President Company (APC) in 1982. At present, one-third of 45-foot containers are either owned or leased by this company. The remainder are in the hands of operators also engaged in trades connected with the United States

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8 TD/B/C.4/302, TD/B/C.4/314, TD/B/C.4/329.

9 *Cargoware International*, May 1991, pp. 27 - 29.

Table 2

Proliferation of 20- and 40-foot long 9-foot 6-inch high containers
(In real units)

	1978	1980	1983	1986	1990*
Number of 9'06" × 20' and 40' containers	11,701	20,865	43,700	95,240	310,050
Per cent of total	0.89	1.09	1.46	2.62	6.07
Growth rate	1.00	1.78	3.73	8.14	26.5

Note: For 1990 the figures are in TEUs. Only dry-freight containers (excluding thermal, tank, flatrack and other types of special containers) were taken into account.

Source: Computed from the censuses carried out by *Containerization International* in 1978, 1980, 1983 and 1986, and by *Cargoware International* in 1990.

(among them, Sea-Land, with 20 per cent, and Maersk Line, with 15 per cent).

27. Non-marine 48- and 53-foot long containers are completely in the hands of United States operators and lessors. They are gaining in popularity in domestic transportation, but several hundred 48-foot containers have been built to marine specifications. The largest owners of such containers are APC and different railways. About 30 per cent are owned by the leasing companies Genstar and Transamerica.

28. To meeting the demands of shippers, operators are introducing containervessels permitting the carriage of containers of different sizes. Such is the case of some short-sea/feeder class vessels, the versatile design of which permits the accommodation of 45-foot containers as well as standard 20, 30 and 40-foot units. The same vessels can also carry standard-width containers and those with a width of 2,500 to 2,600 mm as well as different heights (from 8-foot to 9-foot 6-inches). There are also examples of larger, newly-constructed ocean-going containervessels, specially designed to carry longer-than-ISO containers as a part of their usual container cargo. It should be borne in mind, however, that existing containervessels have been constructed to carry containers matching the present ISO-standard; hence the cost of their adaptation for carriage of larger containers may be prohibitive. Although non-ISO standard containers are occasionally carried on the deck of containervessels, the carriage of such containers in containerships may lead to some loss of carrying capacity.

29. Inland transportation and handling in ports of non-ISO containers has almost everywhere been connected with problems and has sometimes been impossible. At the session of the UNCTAD Group of Experts on the Development, Improvement and Operation of Ports (September 1990) the question of oversized containers was raised many times by the representatives of different ports. In their recommendations the Group of Experts, most of whom were from developing countries, expressed deep misgivings about the changes underway in the dimensions of containers. It was noted that even the high-cube containers with the base geometry corresponding to the current standards raise problems of handling and carriage.[10]

30. ESCAP has recently undertaken a study to define policy options for the inland transportation of high-cube, oversize and overwidth containers in the countries of the Asian region.[11] The report makes "general statements on problems to be encountered" in the handling, storage and inland transport of non-ISO containers which, in general, are valid not only for ESCAP countries, but for many others and especially for developing countries.

31. From these statements, it follows that in relation to port operations, a great deal of equipment may become obsolete or lose a substantial part of its productivity when the necessity of handling non-ISO containers, especially over-long containers, arises. Such equipment includes quay-side and yard gantry cranes, straddle carriers, trailers, fork-lift trucks and reach stackers. Non-ISO containers also create problems in the pattern of spacing of containers in terminals be-

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10 TD/B/AC.7/12.

11 E/ESCAP/STC.13/3.

cause they require more surface and cannot be stacked according to the usual pattern of spacing based on the modular dimensions of standard containers.[12]

32. The report refers to many problems connected with the road transport of non-ISO containers in ESCAP countries where, as elsewhere in the world, the physical and legal limitations often make this transport impossible. Safe transportation of longer containers on existing vehicles and trailers cannot be ensured because they cannot be properly fastened. Transport of high-cube containers requires the use of special low-bed vehicles and, therefore, additional investments. Furthermore, in road transport an extension of the maximum width beyond 2.50 metres in many countries would not be acceptable, given the fact that this width has been used as the parameter for establishing the safety distance in highway engineering.

33. Rail transportation of non-ISO containers is not possible without costly adaptations of rolling stock and infrastructure. This applies to both high-cube containers with standard base dimensions and the longer, wider containers. Even the railways in Europe have to make special arrangements for the transportation of high-cube containers. When a railway uses wagons capable of carrying three 20-foot containers for transportation of 45-foot containers, this leads to a 25 per cent loss of traffic capacity and makes transportation more expensive.

34. Acquiring specialized low-bed platforms for the carriage of higher and wider containers means significant additional costs. For example, one TEU slot on new low-bed rolling stock of the British Railways (BR) will cost GBP 35,000 as compared to GBP 20,000 per TEU slot for the present modern rolling stock used for the carriage of ISO standard containers. Low-bed wagons with wheels of a smaller diameter will have a shorter service life and will require more maintenance and high repair costs. Moreover, wheels of a smaller diameter will cause more wear and damage of rails than wheels of the usual diameter. As to the cost of adapting the loading gauge for the British Railways, a figure of between GBP 600 million and GBP one billion has been quoted.[13]

35. When considering the above-mentioned report at its thirteenth session (17-21 December 1990), the ESCAP Committee on Shipping, Transport and Communications, while admitting that technological advances and trade requirements might make the introduction of a new generation of over-sized containers inevitable, nevertheless cautioned that special attention and care would have to be exercised in drawing up conclusions, particularly in view of the social and economic impacts of their introduction. The Committee stated that a number of developing countries had just introduced containerization and had invested heavily in both equipment and infrastructure for handling ISO containers. They could ill-afford to make further additional investments required by the introduction of over-sized containers in the present economic and financial climate and at the time when they were in the process of consolidating their containerization developments.

36. Another regional feature is the spreading use in Europe and in short-sea traffic of "standard" and "cellular" type 2.5-metre wide containers, adapted for the side-by-side accommodation of the European railway pallets. In many respects these containers comply with ISO standards, except for their width and stacking parameters. The "cellular" type is compatible with the cells of containervessels operating in certain European trades. Though their total number in the world container fleet is still very small (about 30,000 TEUs in mid-1991), big orders have been placed by some operators, indicating that 2.5-metre wide containers will have a certain future in regional and coastal trades. Recent tests of these containers in Australia and in the Republic of South Africa have confirmed these prospects.

III. Possible advantages from the use of non-ISO containers

37. Larger containers have been introduced by the industry in order to meet the market requirements with a view to transporting low-density manufactured products. The ESCAP report mentioned above has indicated that, despite the many problems and disadvantages, the use of non-ISO

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12 In this respect, at the International Cargo Handling Co-ordination Association (ICHCA) seminar entitled "The intermodality of Future Containers" in February 1991, in relation to the impact of larger container dimensions on inland container terminals, it was stated that in case "a mixture of sizes are to be utilized, rather than the current limited number of ISO sizes, the cost of a depot's overall services may rise by 20 per cent for no real increase in container throughput."

13 *Cargo Systems*, March 1991, p. 57.

containers could also have certain advantages because, in the case of larger dimensions, for the same amount of cargo fewer containers will be required. This may lead to:

(a) Reductions in port handling charges per unit of cargo;

(b) Savings in energy consumption and air pollution because of the reduction of number of movements of containers;

(c) Less road congestion in the port area;

(d) Reduction of documentation and administrative expenses.

38. The ESCAP report contains certain information on the economic efficiency of the use of bigger than ISO-standard containers for operators and shippers. The analysis of economic efficiency has been calculated on the basis of data submitted by actual operators.

39. From these calculations it follows that for ocean carriage in the United States - South-East Asia trade, shippers attain 10 per cent economy in relative freight charge per cubic metre when using 45-foot high-cube container instead of the 40-foot standard container. The relative economy becomes 35 per cent in comparison with the use of the standard 20-foot container. The report also provides comparative data regarding inland transportation in different types of containers from the port of Seattle to various inland destinations in the United States by rail (see table 3). As may be seen, the option with the use of 45-foot containers is the most economical from the point of view of capacity utilisation.

Table 3

Comparative rates for transportation in different types of containers

Destination (From the port of Seattle)	20-foot	40/45-foot	20/40/45-foot
	COFC		TOFC
Denver	100	105	126
Chicago	100	119	191
Detroit	100	121	179
Minneapolis	100	105	144
Kansas City	100	126	146
Memphis	100	126	148
Dallas	100	120	144
Kearney	100	106	136
Atlanta	100	112	144

Note: 1. The rates are relative to the lowest rate set at a value 100 for 20-foot container carried by rail. All rates include drayage from the terminal to the rail ramp and final delivery from the rail ramp at the point of destination.

2. COFC - Container on flat car, TOFC - Trailer on flat car.

Source: *Policy Options for the Distribution of Maximum Dimension ISO Containers*, ESCAP report, July 1991.

IV. Developments in the field of standardization

40. Work on the standardization of general-purpose dry-freight containers used in sea, road and rail transport with a world coverage is carried out in the ISO Technical Committee TC 104. In line with the declared ISO policy of maintaining a high degree of stability of container standards, the only significant changes incorporated into the ISO 668 standard since its inception in 1964 have been the introduction of 8-foot 6-inch high containers and the increase to 24 tons of the maximum gross mass of 20-foot containers. Although these were important modifications, they did not affect the intermodality or interchangeability of standard containers.

41. At its London meeting in 1989, TC 104 decided to recognize the height of 2.9 metres (9 foot 6 inches) for 30- and 40-foot containers. The pressure to recognize this height as a standard had

been considerable and sustained. However, noting that inclusion of a new height would constitute a new dimension under resolution 22/1978, and taking into account the concern that had been expressed on many occasions, the central secretariat of ISO postponed further action on this proposal. It requested TC 104 to prepare a comprehensive report and evaluation showing that these amendments were in the common interest of all parties concerned. This report would be drawn to the attention of all ISO members and competent United Nations bodies and only after such consideration would a decision be taken.

42. A report of this nature would be especially opportune, taking into account the very serious opposition to the introduction into the ISO standards of the height 9 foot 6 inch and the very slight majority which had supported this proposal within TC 104. High-cube containers raise problems with regard to height limitations in inland transportation in many countries of the world. This finding has been reflected also in the UNCTAD secretariat document TD/B/C.4/329. Unfortunately, the ISO report was never submitted, and at its sixteenth session in May 1991, TC 104 adopted a resolution confirming the introduction of an additional container height of 9 foot 6 inches into the ISO 668 standard. This decision goes contrary to the requirements of developing countries, and they did not support it within TC 104. The infrastructure of many countries cannot accomodate such containers because of limitations of their inland transport systems and there is no prospect of containers of such a height finding universal international use.

43. Besides the trend towards larger containers, ISO is also considering a proposal to upgrade the standard rating of 20-foot container from a newly increased 24 tons up to 30 tons, that is the present standard rating of the 40-foot container. This would permit more efficient loading of containers with high-density cargo. Moreover, certain manufacturers have already been producing 20-foot containers with a 30-ton rating. This applies especially to 20-foot tank containers and specialized containers for bulk cargo.

44. However, heavy (and in fact overloaded) containers have already caused many problems, and not only for the transport infrastructure of developing countries. The Institute of International Container Lessors (IICL) has reported that even 20-foot containers rated at 24 tons have difficulty with bridge and highway limitations when filled to the maximum gross mass. Experiments carried out in the United States have led to a recommendation that 20-foot containers be held to a cargo weight of 37,000 pounds (16.8 tons) and 40-foot containers be limited to 44,000 pounds (19,95 tons), whenever they are destined for intermodal movement on highways in the United States. The problems in developing countries, where road surfaces and rail tracks are often in poor condition, could be much more serious. Beside the damage to the transport infrastructure and the consequential growth of maintenance and repair expenses as a result of the increased axle-loads, heavier containers create a safety problem during their handling in terminals. For these reasons, the proposal to raise the rating of 20-foot containers up to 30 tons was not supported by TC 104.

V. Proposal for a new generation of containers

45. Pressure for the introduction of larger-than-ISO standard containers has been reflected in the work of ISO and an attempt to introduce a new container standard has been made. In 1987, Working Group 4 "Future Containers" (WG4) within TC 104 was reconvened and assigned the task of developing a standard for a new series of containers. According to the to the Group's mandate, this standard should:

(a) Take full advantage of road width limits of 2.6metres (8'06");

(b) Permit a height of up to 2.9 metres (9'06"); and

(c) Allow the upper limit and intermediate sizes of container lengths to be optimized.

46. However, subsequent meetings of this group revealed the complexity of the problem and the difficulty in finding a universally acceptable solution. At the meeting of TC 104 in London (1989), no agreement was reached within WG4 regarding the length and width of the future generation containers. Moreover, it was generally agreed that the work in progress within WG4 should be limited to the exploratory stage until a more thorough cost/benefit analysis could be made of the consequences of a future generation of containers. As a result of its discussion, TC 104 adopted a resolution stipulating that:

(a) "WG4 shall develop guidelines on technical matters relating to future containers;

(b) WG4 shall study dimensions and ratings, corner fittings, base structure and tunnel requirements;

(c) In its review of container widths, WG4 will continue to consider 2.6m as as well as 2.5m widths;

(d) A full and worldwide economic evaluation for the requirements of future containers will be requested of the Economic and Social Council and its subordinate bodies such as the regional Economic Commissions, UNCTAD and all relevant non-governmental organizations."

47. Notwithstanding this resolution WG4 has not limited its work to purely exploratory exercises but has developed a technical report entitled "Future wide-body containers". Though this document was not intended to be regarded as an international standard, it nevertheless, did propose "a prospective standard for provisional application" for a period of not more than two years after its official publication by ISO. After this probationary period, during which "information and experience of its use in practice may be gathered", it may be extended for another two years, *converted into an international standard*, or withdrawn.

48. This technical report has proposed the following main external dimensions for future generation containers:

Height:	2,896 mm (9 feet 6 inches)
	2,591 mm (8 feet 6 inches)
Length:	7,430 mm (24 feet)
	14,935 mm (49 feet)
Width:	2,595 mm (8 feet 6 inches).

These parameters differed from those proposed by the regional standardization bodies, which had been based, in general, on units already in operation.

49. In view of the massive opposition voiced before and during the sixteenth session of TC 104, the WG4 document was not adopted for publishing as an ISO technical report. Indeed, as all the previous changes in international standards on container dimensions had been of an evolutionary character, and did not influence the interchangeability of containers with those of the existing standard, the proposed wide-body containers with a different base configuration would be incompatible with elements in the existing transport chain, including infrastructure of inland transport and ports. These containers do not exist in reality and, as experience has shown in relation to the existing larger-than-ISO standard containers, they could not be easily accommodated by existing transport systems in many countries. Moreover, the proposed parameters of the new generation containers would not benefit the users and manufacturers of the existing fleet of non-ISO containers.

50. The United States Technical Advisory Group for Standardization of Freight Containers has proposed its new standard "Requirements for domestic dry van cargo containers", with the following parameters:

Height:	2.9 metres (9 feet 6 inches)
Width:	2.6 metres (8 feet 6 inches).
Length:	40 foot
	45 foot
	48 foot
	53 foot
Maximum gross mass:	67,000 pounds (30,481 kg).

The arrangement of handling appertures of these containers corresponds to the arrangement of corner fittings of 40-foot ISO containers.

51. In Europe, ISO containers are, in general, used only in connection with maritime transport. The development of combined road-rail transport on the European continent has led to the introduction of specialized transport equipment intended for use in national and international movements of goods purely in inter-European traffic, the inland container and swap-body, adapted to

accommodate side-by-side two pallets widely used by the European railways. According to a definition given by the Group of Experts on Combined Transport of the Economic Commission for Europe (ECE) "a swap-body is a container designed especially for combined road and rail transport which, however, cannot be stacked and cannot be lifted by its top."

52. The Technical Committee 119 "Swap bodies for combined goods transport road/rail" of the European Committee for Standardization (CEN) has been working for some time on standardization of the equipment used for combined rail/road transport in Europe. The dimensions for general purpose swap-bodies, proposed by this Committee, are reproduced in table 4.

Table 4

Proposed dimensions of European swap-bodies

Type	Length mm	Width mm	Height mm
A 1219	12,192	2,500	2,670
A 1250	12,500	2,500	2,670
A 1360	13,600	2,500	2,670
B 912	9,125	2,500	2,670
B 1035	10,350	2,500	2,670
C 715	7,150	2,500	2,670
C 745	7,450	2,500	2,670
C 782	7,820	2,500	2,670

Note: Swap-bodies of class C are equipped with bottom fitting positions according to the specification for IC (20-foot) ISO containers.

Source: *Impact of containers larger than today on world trade and transport* (Report of the Studiengesellschaft für den kombinierten Verkehr e.V., Francfurt/Main, September 1990).

53. Inland containers are in use primarily by the European railways. They have dimensional characteristics corresponding to ISO 668 standard (except for the width, which is 2,500 mm to accommodate two side-by-side railway pallets) and are equipped with side doors permitting their stripping without unloading them from the wagon. Swap-bodies have been developed according to the requirements of road transport with the width 2,500 mm and a length permitting the full use of the dimensional pattern offered by a road train. This equipment is designed for inland transportation and so its standardization cannot influence the ISO standards which have worldwide application.

VI. Correspondence between sizes of containers and pallets

54. Domestic and regional distribution systems, even before the introduction of the present ISO standards for containers, have been based on the use of pallets. In Europe, there are two prevailing pallet dimensions: industrial 1,000 × 1,200 mm and 800 × 1,200 mm widely used by railways and retail distribution systems. The packaging industry has developed a modular system of packages based on the 400 × 600 mm module, which was recognized as the basic module by ISO. In the United States several different standard sizes of unit loads and different sizes of pallets and slip sheets are currently in use, but the 800 × 1,200 mm pallet, the most popular in Europe, is not used at all.

55. The ISO Technical Committee 51, dealing with pallets for the unit load method of material handling, in its ISO 3676 standard, has adopted, as a preferred, a unit load of 1,000 × 1,200 mm, based on a pallet of the corresponding dimensions. This standard also recognizes 800 × 1,200 mm and 1,140 × 1,140 mm pallets. The last plan dimension is derived from the minimum internal width of ISO standard freight containers (2,330 mm).

56. As regards the different sizes of pallets in use in Europe and the United States, the correspondence between the dimensions of pallets and containers is not very significant for international

maritime trade. The vast majority of containers in intercontinental trades are loaded with different goods without the use of pallets. Shippers have adapted their consignments in a way that efficiently fits into ISO standard containers without wasting internal space.

57. In this respect, already in 1969 a conclusion has been drawn up at an international level, whereby among the three elements of the transport chain - package, pallet and container - the one most difficult and the most expensive to change would be *the dimensions of containers*. The unit load sizes chosen should fit the freight containers; the transport packages sizes and the pallet sizes should fit the unit load sizes. What had been proposed in relation to the future generation containers was quite contrary to the spirit of this conclusion. It was an attempt to replace the present global container system by a new one based on modules having regional application.

VII. Conclusion

58. The discussion of the problems of container dimensions under way in many international organizations, ECE, ESCAP and other United Nations regional commissions, the European Conference of Ministers of Transport (ECMT), the European Communities as well as in non-governmental professional organizations (in particular, ICHCA) has revealed that most countries of the world are not ready for a change in the existing international container standards.

59. On the regional level, operators have been introducing loading units of bigger dimensions in order to meet specific requirements of trades and logistics systems within the limits permitted by existing regulations. These limits may be extended only with costly adaptation of infrastructure and/or the necessity to introduce special rolling stock to permit the movement of bigger containers and swap-bodies. In each case a cost/benefit analysis, as well as a study of the social and environmental impact should be made to evaluate the expediency of introducing changes.

60. The present situation in developing countries precludes them adapting their transport systems to bigger container dimensions. Nor do their economies and trades require the introduction of new container sizes. At its fourteenth session, the UNCTAD Committee on Shipping expressed reservations about the introduction of non-ISO standard containers. Operators from developed countries pressing for the use in developing countries of containers bigger than the present ISO standard size should be aware of this situation and of the cost effect involved in the use of such containers for the transport systems of developing countries and these operators should be prepared to bear the costs.